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EXTENDED LABORATORY INVESTIGATIONS ON THE TOXICITY OF DDT RESIDUES TO ADULTS OF *ANOPHELES QUADRIMACULATUS* [1]

By R. W. Fay, *Senior Assistant Sanitarian (R)*, S. W. Simmons, *Sanitarian (R)*, and J. M. Clapp, *Junior Assistant Sanitarian (R)*, *United States Public Health Service*

Investigations of certain factors influencing DDT residual toxicity to adult mosquitoes begun in 1944 were reported in 1945 (*1*). These studies have been continued to determine the effects of prolonged aging on residual deposits. Although the time interval involved in these DDT residual toxicity studies of long duration exceeds the limits of practical control, the studies show trends in the deterioration of DDT deposits which are not truly evident in short-range experiments.

The present paper considers the following points: (1) Modifications in the general testing technique, (2) extension of the previous studies on the relationship between exposure time and mortality, (3) more complete studies on the relationship between dosage and mortality, (4) results obtained from the better solvents in DDT emulsions, and finally, (5) the relative susceptibility of the two sexes of adult *Anopheles quadrimaculatus* mosquitoes to DDT.

GENERAL PROCEDURE

The technique and apparatus used in testing was previously described (*2*) and with the few modifications discussed in this paper have been continued in use for the present results. In brief, 3- to 4-day-old insectary-reared adult *A. quadrimaculatus* mosquitoes of both sexes were employed. The males are more susceptible to DDT than the females, however, and unless indicated, only the results obtained

[1] From Communicable Disease Center, Technical Development Division (Savannah, Ga.), States Relations Division.

with the females will be considered. A test sample, containing at least 20 adult females, was transferred from a stock cage into a glass lantern chimney. It was found advantageous to coat one-half of the chimney with white enamel to form a good background for counting the insects as they flew out of the stock cage. The test sample was then transferred by an air current into an exposure chamber.

The exposure chamber consisted of a wooden framework into which four 3- by 12-inch panels of the test material could be fitted to form a chamber with an exposed treated surface of one square foot on the four sides, and an untreated surface of one-eighth square foot on the two ends. Circular openings, 2⅞ inches in diameter, were cut in each end of the framework and then fitted with removable metal collars, one of which was closed by a metal screen, the other remaining open. The remaining portions of the untreated ends of the exposure chamber were covered with removable paper shields. The end openings were closed by sliding panel doors, a wooden one at the screened end and a metal one at the other. With these precautions, all walls of the exposure chamber were either DDT-treated surfaces or surfaces which could be replaced or adequately cleaned to prevent cumulative contamination from a series of successive tests using the same framework. During the exposure period, the chamber was entirely darkened to minimize any light attraction, and placed on its side, as it was found by repeated observations that mosquitoes would remain on the treated sides in this position. By stringing the four panels together, they could be treated by hand or power sprayers as a single flat surface of 1 square foot.

After a given exposure period the mosquitoes were transferred to an observation cage and the immediate knock-down, the 24-hour, and the 48-hour mortalities were recorded. Control samples were handled in a similar manner, but untreated panels were substituted in the exposure chamber. The percentage of kill was calculated by the formula $\frac{D-E}{T-E}\times 100$, where T was the total number of mosquitoes in the test run, E was the number of dead expected in a control run of size T, and D was the number of dead mosquitoes in the test run.

In presenting the chronological data graphically, a smoothing formula was used as follows: $B'=\frac{A+2B+C}{4}$, in which B' was the corrected point as plotted, A was the reading of the previous period, B was the present reading, and C was the reading of the following period. The symbols A, B, and C represent the average of two or more runs in every case.

RELATIONSHIP BETWEEN EXPOSURE TIME AND MORTALITY

Procedure.—As a basis of comparison the following formula was selected as standard: DDT 35 gm., Triton X-100[2] 4 gm., and xylene to make 100 cc. of spray concentrate. The concentrate was mixed with water so that 4 cc. of diluted spray gave the desired residual deposit, recorded in milligrams of DDT per square foot. These emulsions were sprayed on four sets of panels at rates of 50, 100, 200, and 300 mg. DDT per square foot, and duplicate tests were made on a graded series of exposure periods ranging from 2 minutes to 4 hours. Equal numbers of tests were made on the four residual levels and effective kills were defined by the previously mentioned formula.

Results.—Since comparable tests were run on 50-, 100-, 200-, and 300-mg. dosages for each exposure period, at each selected period after spraying, it was possible (table 1) to present an average picture of DDT residual efficiency over this dosage range and to illustrate the combined mean of the 4 dosage levels graphically (fig. 1).

TABLE 1.—*Percentage mortality at 48 hours of* Anopheles quadrimaculatus *adults after 35-, 60-, 90-, 120-, and 180-minute exposure periods to DDT residues of known age* [1]

Age of residue (in weeks)	35 minutes		60 minutes		90 minutes		120 minutes		180 minutes	
	Mean percentage	Mean standard error	Mean percentage	Mean standard error	Mean percentage	Mean standard error	Mean percentage	Mean standard error	Mean percentage	Mean standard error
0	86	4.3	98	1.4	100	0	100	0	100	0
4	84	3.4	88	3.1	92	3.5	100	0	100	0
8	68	2.9	86	2.5	87	1.8	95	1.7	100	0
12	47	7.8	66	6.7	69	7.5	89	3.1	99	.7
16	38	5.8	57	6.1	69	5.8	87	4.2	96	.9
20	28	4.8	49	6.2	68	4.0	85	5.5	93	2.5
24	37	3.9	60	1.4	78	2.1	88	2.1	94	2.6
28	23	4.9	67	8.8	78	4.6	83	4.7	97	2.6
32	23	10.4	57	4.2	83	5.0	85	1.8	97	.9
36			53	7.4	72	2.7	77	1.8	91	5.7
40			54	7.2	59	5.2	69	2.3	90	6.4
44			57	3.3	66	9.6	73	1.7	93	2.8
48			64	1.5	75	11.7	82	3.4	96	.7
52			66	7.3	77	11.6	84	1.8	95	1.2
56			54	6.4	72	11.9	82	1.7	92	2.9
60			46	8.4	62	10.8	79	5.4	89	4.9
64			40	11.7	51	8.1	74	9.2	87	4.6
68			37	9.8	42	8.9	64	9.8	84	3.9

[1] These data were derived from average kills at 50, 100, 200, and 300 mg. DDT per square foot.

In analyzing the data (table 1) the mean 48-hour mortalities from each of the four residual levels were quite comparable during the first 12 weeks, as shown by their small standard error from the combined mean value, but after 12 weeks the standard error from the mean increased. This was the result of wider variation between the mortalities at the respective residual levels.

[2] An aralkyl-polyether-alcohol emulsifier supplied by the Rohm & Haas Co., Philadelphia, Pa.

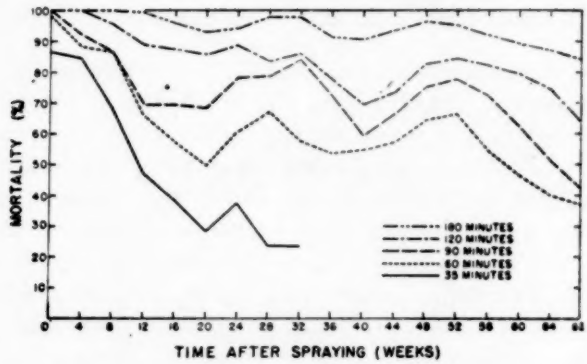

FIGURE 1.—Average 48-hour mortalities of *Anopheles quadrimaculatus* adults after 35-, 60-, 90-, 120-, and 180-minute exposures to DDT residues of 50 to 300 mg. per square foot from ½ to 68 weeks after application.

From the relationship between mortality and exposure time (fig. 1) it is apparent that during the first 6 months after application there is more loss of effectiveness in DDT deposits at a shorter exposure period, i. e., 30 minutes, than at a longer period, i. e., 180 minutes.

In an analysis of the results from the 60-minute exposure period (fig. 2) the mean values from the four residual levels have been plotted and the closest-fitting straight line *A* determined. A chi-square test

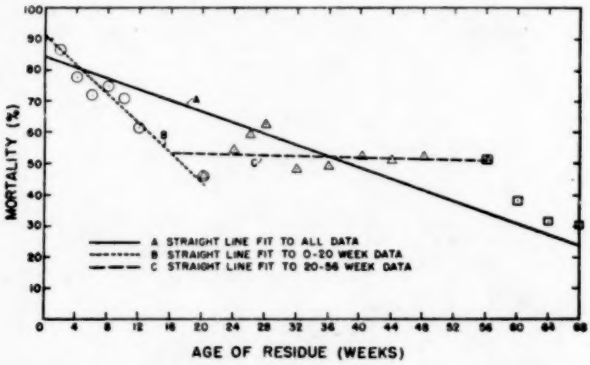

FIGURE 2.—Interpretations of the average 48-hour mortalities of *Anopheles quadrimaculatus* adults after 60-minute exposures to DDT residues of 50 to 300 mg. per square foot from ½ to 68 weeks after application.

of goodness of fit of the data to the line *A* gave a value of 131.157, which indicated a probability of less than 0.01 that the single-line relationship was adequate. The data were then broken into two groups, namely, one formed from residues 0 to 20 weeks old and one formed from residues 20 to 56 weeks old. The closest-fitting straight line was calculated for each datum group. The chi-square value for the line *B* for the data up to 20 weeks of age was 2.038, lying between the

0.95 and 0.50 values of probability, and the line *C* for the data from 20 to 56 weeks had a chi-square value of 7.723, approximating the 0.50 probability level. The two lines, *B* and *C*, intersected at the 16-week point on the graph, and a test of the data from 8 to 36 weeks showed the data to fit this intersecting point better than the closest-fitting straight line over that interval. This analysis might indicate that more than one factor is important in the deterioration of DDT residual deposits.

There are many possible theoretical explanations for the loss in toxicity of DDT residues. Among these may be flaking, chemical deterioration, chemical combination with substrata, absorption, physical occlusion, and perhaps others. Metcalf et al. (*3*) showed that flaking was a factor in the loss of DDT from sprayed surfaces. A certain portion of the DDT penetrates into most absorbent surfaces when applied as an emulsion spray.

Deterioration in effectiveness (fig. 2) terminated after about 16 weeks, followed by a period of almost constant effectiveness for the next 6 months, after which a rapid drop in effectiveness occurred. The surface deposits would be the more susceptible to flaking, and it is possible that a portion of them might be removed by the time the leveling off occurs. In this respect, loss of effectiveness by flaking is plausible. However, the information on DDT toxicity deterioration is too little developed to definitely evaluate the relative importance of the various factors that might be concerned.

Since tests were run at more exposure periods than shown in table 1, a better picture of the relationship between the exposure period and the 48-hour mortalities at ½, 4, 12, 26, 36, 52, and 68 weeks after treatment can be shown in more detail (fig. 3). This graph indicates

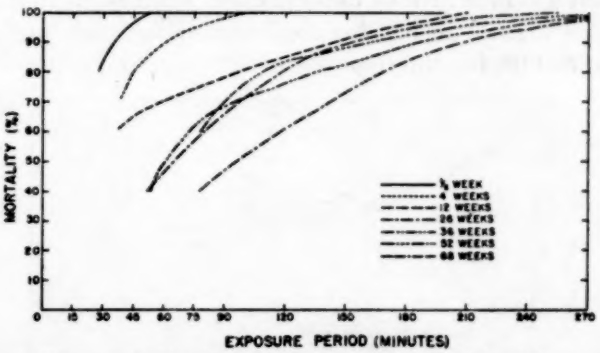

FIGURE 3.—Average 48-hour mortalities of *Anopheles quadrimaculatus* adults in relation to exposure periods ½, 4, 12, 26, 36, 52, and 68 weeks after application of DDT residues of 50 to 300 mg. DDT per square foot.

that the slope of the curve showing the relationship between percentage mortality and the exposure period gradually decreases with the older residual DDT deposits.

RELATIONSHIP BETWEEN DOSAGE AND MORTALITY

Procedure.—To determine the difference in the residual effectiveness of 100 and 200 mg. DDT per square foot, a series of panels was prepared at each concentration, and the adult mosquitoes were exposed to residues of various ages. Average 48-hour mortalities after 60-minute exposures of adult mosquitoes to 100 and 200 mg. DDT per square foot from ½ to 84 weeks after spray applications are shown in table 2.

TABLE 2.—*Percentage mortalities of* Anopheles quadrimaculatus *adults from 60-minute exposures to deposits of 100 and 200 mg. DDT per square foot from a xylene-DDT spray at ½ to 84 weeks after application*

Age of residue (in weeks)	Milligrams DDT per square foot		Age of residue (in weeks)	Milligrams DDT per square foot	
	100	200		100	200
½	95	98	32	44	67
1	95	89	34	58	67
2	92	86	36	50	63
3	85	92	38	52	71
4	85	90	40	36	62
6	82	85	44	57	46
8	84	79	48	58	40
10	79	79	50	49	45
12	80	78	52	54	51
14	77	73	56	53	53
16	69	77	60	53	63
18	71	71	64	52	69
20	72	70	68	44	60
22	55	67	72	37	43
24	51	64	76	37	27
26	58	64	80	24	35
28	52	67	84	12	------
30	48	70			

The results for the deposits of 200 mg. DDT per square foot (fig. 4) show a fairly rapid rate of deterioration in effectiveness over the first 30 weeks and a slower rate of deterioration from 30 to 70 weeks. The best-fitting straight line has been calculated for each portion of the data. The results for the deposits of 100 mg. DDT per square foot

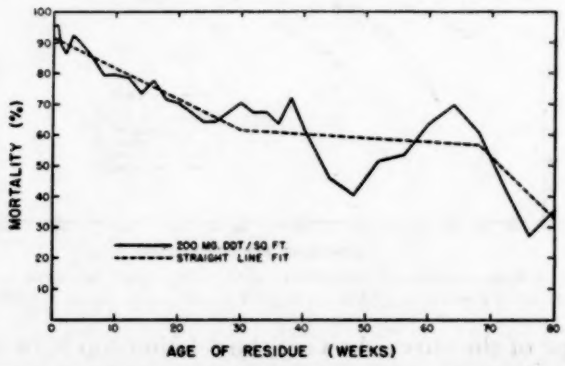

FIGURE 4.—Percentage mortalities of *Anopheles quadrimaculatus* adults 48 hours after 60-minute exposures to residues of 200 mg. DDT per square foot at 1 to 80 weeks after application.

(fig. 5) show approximately the same intervals of deterioration. A comparison of the best-fitting straight lines (fig. 6) for the 100- and 200-mg. dosages indicates that the 200-mg. dosage is appreciably more effective than the 100-mg. dosage. In direct comparison, the 200-mg. dosage after 16 weeks was about equal to the 100-mg. deposits after 12 weeks.

The knock-down rate at the end of the 60-minute exposures shown in comparison to the 48-hour mortalities (table 3) demonstrates that comparative 60-minute knock-down rates were a good indication of relative toxicity.

TABLE 3.—*Percentage knock-down and 48-hour mortality of* A. quadrimaculatus *adults from 60-minute exposures to deposits of 100 and 200 mg. DDT per square foot, from a xylene-DDT spray at 0 to 5 months after application*

Age of residue (in months)	Milligrams DDT per square foot			
	100		200	
	Percentage knock-down	Percentage mortality	Percentage knock-down	Percentage mortality
0	94	100	86	100
1	47	85	81	95
2	55	80	75	90
3	23	75	35	80
4				
5	14	50	35	75

Further investigations on residue concentrations of 25, 50, 100, 200, 300, and 400 mg. DDT per square foot confirmed the previous observations (*1*) that residues of less than 100 mg. DDT per square foot showed inferior residual toxicity for mosquito control. Residues of more than 200 mg. DDT per square foot were not sufficiently better than 200 mg. DDT deposits to be economically feasible.

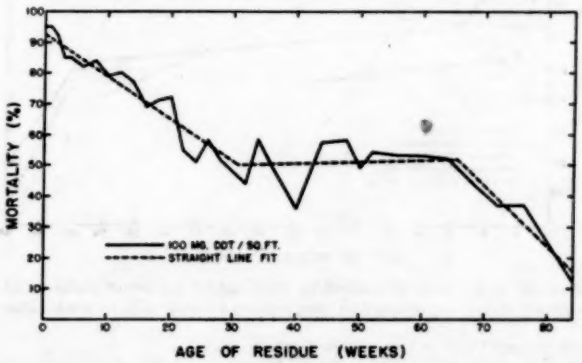

FIGURE 5.—Average 48-hour mortalities of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 100 mg. DDT per square foot 1 to 84 weeks after application.

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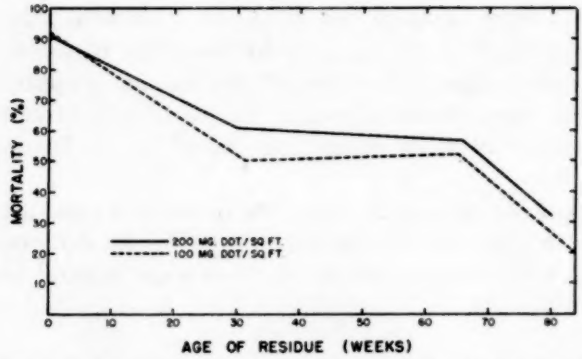

FIGURE 6.—Comparison of the 48-hour mortalities of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 100 and 200 mg. DDT per square foot at 1 to 84 weeks after application.

RELATIONSHIP BETWEEN MORTALITIES FROM DDT RESIDUES SECURED FROM VARIOUS SOLVENTS

Procedure.—Preliminary experiments (*1*) were made on a series of DDT solvents in emulsions, and from these solvents five were selected for further testing on the basis of availability, cost, and chemical and physical suitability. A series of panels was sprayed with various solvent-DDT emulsions to give 200 mg. DDT per square foot, and these panels were tested with 30-minute exposures over a period of at least 6 months. The results with these solvents, namely, xylene, kerosene, PD–544C,[3] Solvesso No. 2,[4] and Velsicol AR–50,[5] are given in table 4. In presenting the data graphically (fig. 7), the 2 or 3 best-fitting straight lines for each series of data in table 4 have been plotted.

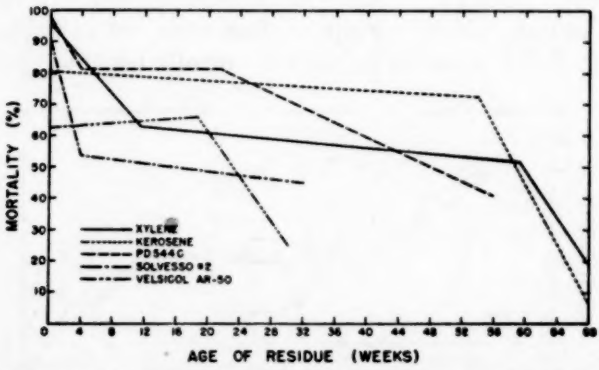

FIGURE 7.—Comparison of the 48-hour mortalities of *Anopheles quadrimaculatus* adults after 30-minute exposures to 200 mg. DDT per square foot from various solvents ½ to 68 weeks after application.

[3] A product of the Socony Vacuum Corp., New York, N. Y.
[4] A product of the Standard Oil Co. of New Jersey, New York, N. Y.
[5] A methylated naphthalene solvent of the Velsicol Co., Chicago, Ill.

It was noted that the xylene curve showed a faster loss of effectiveness during the first 12 weeks than it did from 12 to 60 weeks. The Solvesso No. 2 curve indicates similar rates in loss of effectiveness, and this solvent is quite similar to xylene in its solvent properties and evaporation rate. The slower volatilizing solvents, such as kerosene, PD–544C, and Velsicol AR–50, however, did not show as marked a

TABLE 4.—*Percentage mortalities of* A. quadrimaculatus *adults 48 hours after 30-minutes exposure to 200 mg. DDT per square foot from various solvents 1 to 68 weeks after application*

Age of residue (in weeks)	Percentage mortalities after exposure to DDT residues from different solvents					Age of residue (in weeks)	Percentage mortalities after exposure to DDT residues from different solvents				
	Xylene	Kerosene	PD–544C	Solvesso No. 2	Velsicol AR–50		Xylene	Kerosene	PD–544C	Solvesso No. 2	Velsicol AR–50
1	90	93	92	84	60	28	71	69	88	42	30
2	89	94	91	----	----	32	54	75	67	----	----
3	89	94	86	----	----	36	47	67	51	----	----
4	86	86	80	54	67	40	50	70	48	----	----
6	80	71	80	----	----	44	62	85	57	----	----
8	74	73	86	52	65	48	59	88	59	----	----
10	70	72	83	----	----	52	51	83	50	----	----
12	60	72	----	50	62	54	47	79	44	----	----
14	55	71	----	48	66	56	54	66	39	----	----
16	63	71	71	48	66	58	55	61	----	----	----
18	60	72	71	48	66	60	52	49	----	----	----
20	63	76	83	50	61	62	42	37	----	----	----
22	68	77	87	51	56	64	34	25	----	----	----
24	64	76	89	51	50	66	27	21	----	----	----
26	66	72	92	45	39	68	20	25	----	----	----

loss of effectiveness during the first 12 weeks. As noted in a companion paper on surfaces and DDT,[6] the xylene and Solvesso No. 2–DDT emulsions gave white crystalline deposits on blue enameled surfaces, whereas the kerosene and Velsicol AR–50 did not give appreciable visible deposits. In view of these observations, the solvent used may influence the type of initial deposits, which in turn may affect the residual effectiveness. If the initial loss of effectiveness is due to mechanical loss of flaking of the DDT crystals, as previously suggested, then the effect of the solvent may be due to its influence on the adherence of the crystals to the surface.

RELATIONSHIP BETWEEN SEX AND DDT SUSCEPTIBILITY

Procedure.—To determine the relative susceptibility of the male and female mosquitoes to DDT residues, a series of panels containing 100 mg. DDT per square foot was prepared. Four 30-minute exposures were made and the relative 48-hour mortalities of the two

[6] See p. 166 of companion paper by the same authors: The comparative residual toxicity of DDT to *Anopheles quadrimaculatus* when applied on different surfaces.

sexes were determined (fig. 8). It can be seen that while the residues showed appreciable loss of toxicity for the females, there was little difference in the male mortalities even after 42 weeks. These runs were paralleled with controls to determine natural mortalities for each sex.

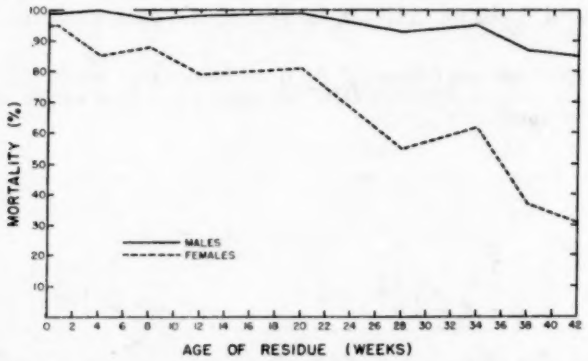

FIGURE 8.—Average 48-hour mortalities of *Anopheles quadrimaculatus* males and females after 60-minute exposures to residues of 100 mg. DDT per square foot at 1 to 42 weeks after application.

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(*2*) Simmons, S. W., and staff: Techniques and apparatus used in experimental studies on DDT as an insecticide for mosquitoes. Pub. Health Rep., Supplement No. 186, pp. 3–20 (1945).

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THE COMPARATIVE RESIDUAL TOXICITY OF DDT TO *ANOPHELES QUADRIMACULATUS* WHEN APPLIED ON DIFFERENT SURFACES [1]

By J. M. CLAPP, *Junior Assistant Sanitarian (R)*, R. W. FAY, *Senior Assistant Sanitarian (R)*, and S. W. SIMMONS, *Sanitarian (R)*, *United States Public Health Service*

Subsequent to initiation of the extended malaria-control program by the United States Public Health Service, many types of households in various sections of the country were sprayed with DDT. In the treatment of premises, surfaces were encountered which varied from those of household walls and furnishings to those of outbuildings and barns. The precautions against damage to surfaces varied considerably according to the surface treated. Since the success of the

[1] From Communicable Disease Center, Technical Development Division (Savannah, Ga.), States Relations Division.

control program and the future practical field use of DDT in homes depended upon the satisfaction of the householder, knowledge concerning the residual effect of DDT treatments on different surfaces, the precautions necessary in application, and the amount of spray required for effective mosquito control was essential.

For the afore-mentioned reasons, investigations at the Henry R. Carter Memorial Laboratory were initiated to determine the following factors: (1) the comparative residual toxicity of DDT sprayed on different materials; (2) the effects of spray applications on different surfaces; and (3) the effect of surface on the final residue distribution.

GENERAL PROCEDURE

Insectary-reared adult *Anopheles quadrimaculatus* mosquitoes, of both sexes, were used in the laboratory tests, but, because the males are more susceptible to DDT, only the mortalities of the females have been considered in this paper. The technique employed has been described previously (*1*). In brief, a sample of approximately 25 females, 3 to 4 days old, was transferred from a stock cage to a glass-lantern chimney and then by an air current into an exposure chamber. The chamber consisted of a wooden framework into which were inserted four 3- by 12-inch panels of the surface to be tested. Prior to testing, the panels had been sprayed by hand or power sprayers as a single flat surface of 1 square foot. After a determined exposure period, the mosquitoes were gently blown into an observation cage by means of an air current and the immediate knock-down, the 24- and the 48-hour mortalities were recorded. In control tests, untreated wooden panels were substituted in the exposure chamber, and the mosquitoes were handled according to the above procedure. Any natural mortality in the controls was evaluated and included in the presentation of results. The percentage of kill was calculated by the formula $\frac{D-E}{T-E}\times 100$, in which T was the total number of mosquitoes in the test sample, E was the number of dead expected in a control run of size T, and D was the number of dead mosquitoes in the test sample.

In presenting the data graphically, a smoothing formula was used as follows: $B'=\frac{A+2B+C}{4}$ in which B' was the corrected point as plotted, A was the reading of the previous period, B was the reading to be corrected, and C was the reading of the following period. In every case, the symbols A, B, and C represented the average of two or more runs.

THE COMPARATIVE RESIDUAL TOXICITY OF DDT SPRAYED ON DIFFERENT MATERIALS

It was thought that the permeability of the surface, the type of surface finish, and the subsurface material might influence the residual toxicity of DDT sprays. Therefore, in order to determine the comparative toxicity of equal amounts of DDT applied to different materials, several series of panels, selected to represent the more typical surfaces encountered in premise spraying, were treated with a 5-percent DDT-xylene emulsion at a rate of 200 mg. DDT per square foot. Duplicate tests, at both 30- and 60-minute exposure periods, were made at two-week intervals after the original spray application. In general, tests were continued until resultant mortalities were well below practical consideration.

To prepare the 5-percent DDT-xylene emulsion, the standard selected for comparison, a 35-percent DDT-xylene-Triton X–100 [2] concentrate was diluted with six parts of water.

Sets of test panels were prepared from the following materials: fabrics, represented by mohair upholstery, drapery or slip-cover goods, tent canvas, and window-shade material; painted surfaces, typified by well-weathered gray enamel, black exterior flat paint, cream interior gloss enamel, spar varnish, rubbing or furniture varnish, and casein water paint; and other frequently encountered surfaces, such as wallpaper, fiberboard, whitewash, plastic screen, linoleum, and simulated adobe.

In panel preparation, field conditions were closely duplicated because the subsurface and surface materials, as well as the conditions of spray application, were considered to be determining factors in DDT residual toxicity. Bearing these factors in mind, plastic screen and fabrics were sprayed on a frame to duplicate window screens and drapes, through which, in normal house spraying, much of a liquid spray passes. After thorough drying, the test materials were mounted on plywood panels.

For the preparation of the paints and varnishes, both the subsurface material and the drying time were taken into account. Whitewash was applied to rough wood similar to that found in barns. Finished oak and dressed pine, exemplifying flooring and framing material, were used as a typical backing for the varnishes and paints, respectively. Two coats each of spar varnish, rubbing varnish, interior enamel, and flat paint were applied to three sets of panels. One set of each type was treated with DDT 1 week after the second-coat

[2] A proprietary emulsifier made by Rohm & Haas Co., Philadelphia, Pa.

application; one set after 4 weeks; and one set after 17 weeks. For comparison, enamel, which had weathered for 3 years, was tested.

Casein water paint required a subsurface typical of interior walls. For this purpose, plaster blocks (3- by 12- by ½-inch) were prepared in molds. After drying a month these blocks were glued to plywood panels, after which two coats of casein water paint were applied to the untreated plaster. One week later the panels were sprayed with DDT. Similar plaster blocks were also used as a base for wallpaper. For this purpose, however, the dried blocks were sized before pasting on the wallpaper with flour paste. Various colors, grades, and textures of wallpaper were tested.

In order to simulate adobe, alluvial clay, which had been silted by natural tidal action on pilings, was used, after screening to remove extraneous matter. A clay slurry was poured into molds large enough to allow for a predetermined shrinkage, dried for 2 months at room temperature, and then the clay blocks were backed with plywood.

The fiberboard and linoleum required no special preparation and were, consequently, merely cut into panels of the correct size and sprayed.

For the purpose of comparing the residual toxicity of equal amounts of spray applied to different materials, the 48-hour mortality from a 60-minute exposure to a deposit of 200 mg. DDT per square foot on plain pine plywood panels was adopted as a standard. This standard was selected because plywood is fairly uniform in composition and easily handled, and because it had served as standard test material in previous laboratory work on DDT residues (*2*).

From the results obtained, the materials were divided into three groups: Those materials with residual toxicity equal to or better than the standard; those with residual toxicity one-half to three-fourths as effective; and those with residual toxicity less than one-half as effective as the standard.

Results equal or better than standard were obtained from the application of DDT emulsion to the fabrics (mohair, canvas, cotton goods, and window-shade material), to wallpaper, and to the rubbing varnishes which had dried for at least 1 month prior to the spray application. The data for each type of material are presented separately in table 1, and all results on the various fabrics have been plotted as a single curve, for comparison with the other surfaces, in figure 1.

The DDT residues on rubbing varnish (10-day drying period), casein water paint, weathered gloss enamel, fiberboard, and wire screen were one-half to three-fourths as effective as the standard. The results obtained from fresh rubbing varnish, water paint, and weathered enamel were almost identical and therefore have been

TABLE 1.—*Percentage mortality at 48 hours of* Anopheles quadrimaculatus *adults after 60-minute exposure periods to deposits of 200 mg. DDT per square foot of known age on different types of surface materials*

Age of residue (in weeks)	Type of surface material						
	Standard pine plywood	Fabrics				Rubbing varnish	Wallpaper
		Mohair	Cotton	Canvas	Window shade		
2	86	100	97	100	99	95	97
4	96	97	95	99	99	93	98
6	94	92	92	98	96	92	96
8	91	90	89	97	89	91	86
10	82	75	89	95	86	91	79
12	70	58	88	92	91	91	82
14	66	72	87	88	97	89	89
16	62	89	93	84	88	89	89
18	58	92	78	82	70	83	89
20	54	94	59	78	62	81	82
22	59	85	47	62	58	78	75
24	62	68	56	49	56	85	69
26	63	54	57	45	61	----------	70
28	67	42	43	49	56	----------	70
30	63	39	39	56	40	----------	67
32	59	39	33	55	----------	----------	61

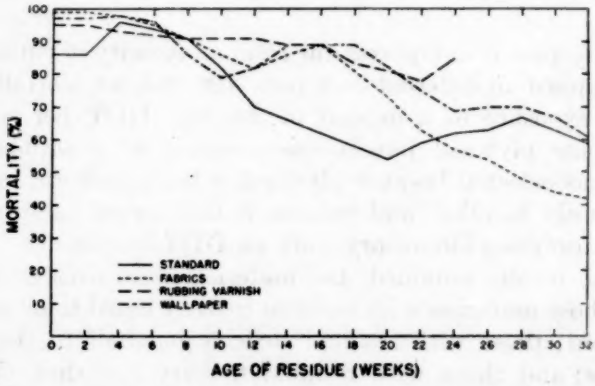

FIGURE 1.—Percentage mortalities at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 200 mg. DDT per square foot of known age on different types of surfaces.

plotted as a single curve in figure 2. The results for each type of material are presented in tabular form in table 2.

In comparison with the standard, results showing one-half or less the effectiveness were secured from surfaces treated with whitewash, spar varnish, and with gloss and flat paints which had dried 1 to 17 weeks previous to spray application. Very little residual toxicity was obtained from linoleum and practically none from the adobe-like panels. The data for each type material are presented separately in table 3, but the results on the gloss and flat paints have been plotted as a single curve in figure 3, for comparison.

TABLE 2.—*Percentage mortality at 48 hours of* Anopheles quadrimaculatus *adults after 60-minute exposure periods to deposits of 200 mg. DDT per square foot of known age on different types of surface materials*

Age of residue (in weeks)	Type of surface material					
	Standard pine plywood	Fresh rubbing varnish	Casein water paint	Old paint	Fiberboard	Wire screen
2	86	97	76	97	91	73
4	96	97	75	97	90	80
6	94	95	64	95	85	82
8	91	88	43	79	83	76
10	82	80	36	59	83	75
12	70	79	54	63	78	77
14	66	85	72	80	77	81
16	62	89	73	87	77	80
18	58	78	59	66	56	71
20	54	50	42	28	29	62
22	59	27	33	15	23	54
24	62	21	23	17	31	48
26	63	30	18	11	26	52
28	67	42	20	6	27	56
30	63	46	18	4	29	42
32	59	42	22	----	21	----

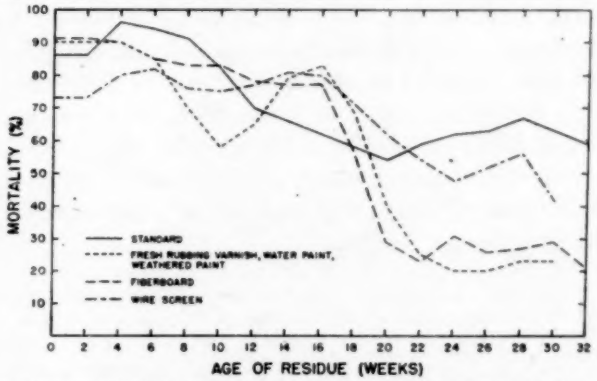

FIGURE 2.—Percentage mortalities at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 200 mg. DDT per square foot of known age on different types of surfaces.

TABLE 3.—*Percentage mortality at 48 hours of* Anopheles quadrimaculatus *adults after 60-minute exposure periods to deposits of 200 mg. DDT per square foot of known age on different types of surface materials*

Age of residue (in weeks)	Type of surface material						
	Standard pine plywood	White-wash	Spar varnish	Cream inside enamel	Black outside paint	Linoleum	Mud
2	86	61	72	37	38	27	8
4	96	50	75	39	44	12	0
6	94	47	70	35	35	3	----
8	91	55	55	21	25	2	----
10	82	53	57	14	26	----	----
12	70	52	48	16	24	----	----
14	66	59	49	15	32	----	----
16	62	51	50	15	25	----	----
18	58	23	38	12	16	----	----
20	54	6	20	10	15	----	----
22	59	8	15	9	14	----	----
24	62	14	15	3	12	----	----
26	63	15	14	2	17	----	----
28	67	16	12	5	14	----	----
30	63	----	10	----	7	----	----

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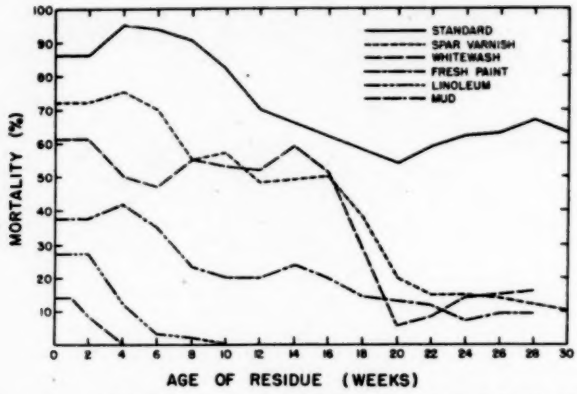

FIGURE 3.—Percentage mortalities at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 200 mg. DDT per square foot of known age on different types of surfaces.

Since the mud panels gave no residual toxicity with the application of 200 mg. DDT per square foot, a series of tests was run to determine if this could be overcome by heavier applications. Additional sets of mud panels were sprayed at the rate of 400 and 600 mg. DDT per square foot. From the results as shown in table 4 and figure 4, it was concluded that DDT in emulsion form could not be applied to mud surfaces for effective control, although it is feasible that other types of mud, some method of sizing the surface, or other means of applying DDT might give better results.

TABLE 4.—*Percentage mortalities at 48 hours of* Anopheles quadrimaculatus *adults after 60-minute exposures to residues of 200, 400, and 600 mg. DDT per square foot of known age on simulated adobe mud surfaces*

Age of residue (in weeks)	Standard pine plywood	Milligrams DDT per square foot on simulated adobe				Age of residue (in weeks)	Standard pine plywood	Milligrams DDT per square foot on simulated adobe			
		200	200	400	600			200	200	400	600
1	100	14	----	----	----	8	91	----	----	----	14
2	86	7	9	27	36	10	82	----	----	----	11
4	96	0	0	14	25	12	70	----	----	----	0
6	94	----	----	0	18						

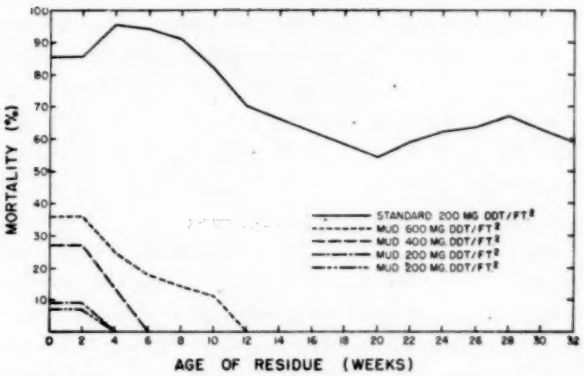

FIGURE 4.—Percentage mortalities at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposures to residues of 200, 400, and 600 mg. DDT per square foot of known age on simulated adobe mud surfaces.

THE EFFECTS OF SPRAY APPLICATION ON DIFFERENT SURFACES

When a 5-percent DDT-xylene emulsion was applied at the rate of 4 cc. or 200 mg. DDT per square foot, the visibility of the deposits varied with the type of surface. Although the residual toxicity was good on discontinuous or extremely irregular surfaces such as fabrics, whitewash, plastic screen, plaster, fiberboard, and wallpaper, the DDT deposits were scarcely visible and caused no marked discoloration even on dark-colored mohair fabrics. In addition, no visible damage from the residue was detected on linoleum or on flat paint surfaces.

It was found that with overapplication of the spray on certain surfaces, the DDT deposits caused some damage by solvent action. For example, if too much liquid was applied to wallpaper, the paper was permanently discolored wherever runs developed. This damage was especially evident on certain blue and green papers. When applied to glass, the DDT crystals were clearly visible, but they could be removed by vigorous rubbing or by the use of a suitable solvent. On high-gloss enamels the application of the emulsion caused some clouding of the gloss, but in uniform applications this was not especially noticeable. The same was true of rubbing-varnish surfaces, but spar varnishes showed a persistent discoloration. This damage could not be removed.

On certain dark-blue and dark-green gloss enamels, the 5-percent emulsion produced an unsightly white deposit, and an effort was made to determine the source of this damage. Two series, containing nine test blocks each, were prepared with two coats of enamel. One series was allowed to dry for 10 days, the other for 30 days. Both series

were sprayed with the following preparations: (1) A concentrate of 35 gm. DDT, 4 gm. Triton X–100, and xylene to make 100 cc., diluted with six parts of water to give a 5-percent emulsion; (2) the same formula as (1) with the substitution of Arctic Syntex A[3] for Triton X–100; (3) the same formula as (1) with the substitution of Velsicol AR–50 (Special)[4] for xylene; (4) the same formula as (1) with the substitution of Solvesso No. 2 [5] for xylene; (5) the same formula as (1) with the omission of DDT; (6) a 5-percent DDT-kerosene solution; (7) xylene; (8) kerosene; (9) water. In the series, the DDT crystals seemed to be the source of the white deposit, and the nature of the deposit was related to the solvent because it occurred only when fast volatilizing solvents, such as xylene and Solvesso No. 2, were employed. The deposit did not appear when kerosene or Velsicol was substituted as a solvent. The observations on both series were comparable. Therefore, the age of the enamel did not influence the type of deposit.

Inasmuch as the DDT-kerosene and DDT-Velsicol mixtures did not produce the white deposit typical of DDT-xylene sprays, the blocks from each combination were tested to determine the residual toxicity to adults of *A. quadrimaculatus*. Since the mortalities were of the same order of magnitude in preliminary tests, it was concluded that DDT must have been present on all the surfaces, but not always as a perceptible white deposit.

THE EFFECT OF SURFACE ON THE FINAL RESIDUE DISTRIBUTION

As evidenced by tests, the nature of the surface material influenced the final distribution of the DDT deposits and their resultant toxicity. In order to ascertain the penetration of the emulsion into dressed wood, a series of white-pine panels was planed so that the surface to be sprayed was uniform. After an application of 200 mg. DDT per square foot the panels were tested at 60-minute exposures, and the subsequent mortalities were recorded. One hundredth of an inch was planed off the surface and the panels again tested. This process was continued until no residual toxicity was noted. The 48-hour mortalities were as follows: Surface mortality, 95 percent; 0.01 inch below the surface, 45 percent; 0.02 inch below the surface, 10 percent; 0.03 inch below the surface, 3 percent; and 0.04 inch below the surface, 0 percent.

The rubbing- or furniture-varnish panels, well dried before spray application, gave a longer residual effect than freshly painted or varnished surfaces; that is, those with a drying period of less than 1 month. Casein water paint showed very little initial loss of toxicity,

[3] Arctic Syntex A, a product of the Colgate Palmolive Peet Co., Jersey City, N. J.
[4] Velsicol, a product of the Velsicol Co., Chicago, Ill.
[5] Solvesso No. 2, a product of the Standard Oil Co. of New Jersey, New York, N. Y.

and no initial loss of toxicity was noted on well-weathered painted surfaces.

The high effectiveness of the DDT-impregnated fabrics may demonstrate that the surface of the material acted as a filter for the deposition of the DDT particles. The ineffectiveness obtained with sprayed linoleum may be attributed to the dissolution of the DDT crystals by the oils present in the linoleum. Thus, most of the spray may have been absorbed and the DDT deposited under the surface. In all probability, the simulated adobe surfaces retained no residue because the spray was immediately absorbed, thereby leaving a minimum of DDT crystals on the surface.

In field tests, certain whitewashed barns treated with DDT spray were found to give a longer residual effect than others treated with the same dosage of DDT. In order to determine the source of the variations in results and the applicability of DDT sprays to whitewashed surfaces, four formulas were made and tested as follows:

(1) ½ lb. lime, 400 cc. water.
(2) ½ lb. lime, ½ oz. salt, 400 cc. water.
(3) ½ lb. expended calcium carbide, 400 cc. water.
(4) ½ lb. expended calcium carbide, ½ oz. salt, 400 cc. water.

Two coats of whitewash were applied to each set of rough wood panels and allowed to dry thoroughly before being sprayed with the standard emulsion at the rate of 200 mg. DDT per square foot.

In addition to the above formulas, DDT was incorporated in lime- and calcium-carbide-base whitewashes and then applied to test panels. Formulas were made so that a two-coat application contained 800 mg. DDT per square foot.

The lime whitewash produced a bright, white finish even when wet, but the calcium-carbide whitewash was gray and did not acquire a bright white until thoroughly dry. The preparations containing salt adhered better than those without salt, and on days of high humidity they presented a moist surface, in contrast to the dry surface of the salt-free preparations.

Preliminary tests indicated that the formulas with salt as a component gave a 15- to 25-percent higher kill than those without salt. The whitewash, incorporated with enough DDT to contain approximately 800 mg. per square foot, gave mortalities 10 to 20 percent better than those secured with an application of spray emulsion of 200 mg. DDT per square foot to dry whitewash. The results for lime- and calcium-carbide-base whitewash, as shown separately in table 5, gave such similar results that they were combined in figure 5 into four curves representing mortality data from whitewashed surfaces sprayed with DDT, both with and without salt, and whitewash containing DDT, both with and without salt.

TABLE 5.—*Percentage mortality at 48 hours of* A. quadrimaculatus *adults after 60-minute exposure periods to residues of 200 mg. DDT per square foot of known age either sprayed on or incorporated in whitewash and salt surfaces*

Age of residue (in weeks)	DDT spray on whitewash (200 milligrams per square foot)				DDT in whitewash (800 milligrams per square foot)		
	Lime	Carbide	Lime salt	Carbide salt	Lime	Carbide	Carbide salt
1	86	58	95	89	75	68	88
2	85	68	93	85	79	71	88
4	72	45	83	73	85	75	88
8	68	55	82	83	79	67	82
10	60	50	80	83	76	64	81
12	56	48	74	78	72	67	80
14	42	40	68	66	65	65	76
16	22	26	68	56	60	64	63
18	16	21	62	50	56	54	39
20					42	31	19

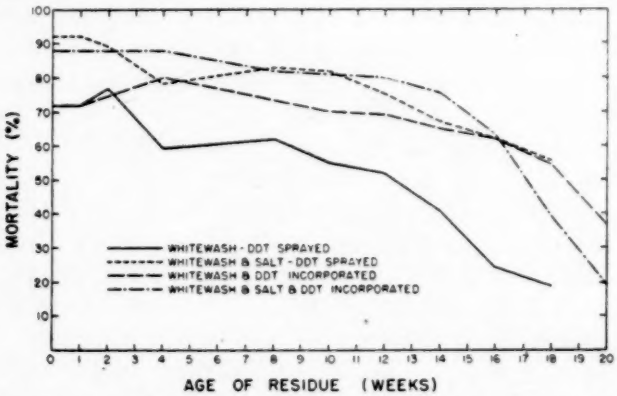

FIGURE 5.—Percentage mortality at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposure periods to residues of 200 mg. DDT per square foot of known age sprayed on or incorporated in whitewash and salt surfaces.

Tests were also conducted to determine the effect of kitchen-grease deposits on the residual toxicity of DDT. Two sets of standard, unpainted, dressed-wood panels were placed on the walls of each of four houses and were thereby treated as an integral part of the walls during the spray application. One set of panels was returned to the laboratory, and the individual panels of the other set were mounted in various places on the kitchen walls, where they remained, except for short test periods in the laboratory. The DDT deposits in the four houses ranged from 106 to 427 mg. DDT per square foot.

Over a period of 36 weeks the study indicated, as shown in figure 6, that the grease deposits on kitchen walls of ordinary households caused an average of 8.27 ± 4.50-percent loss in DDT toxicity beyond that occurring from natural aging. This effect might be augmented

in commercial kitchens in which heavier grease deposits would be expected. The results from the individual houses are presented in tabular form in table 6.

TABLE 6.—*Percentage mortality at 48 hours of* A. quadrimaculatus *adults after 60-minute exposure periods to DDT residues of known age subject to grease deposition*

Age of residue (in weeks)	House	Laboratory	House	Laboratory	House	Laboratory	House	Laboratory
4	92	97	89	99	85	94	91	99
6	92	94	78	99	76	86	84	92
8	85	92	67	99	69	77	73	78
10	74	86	76	96	74	83	69	75
12	75	78	84	91	76	75	58	79
16	85	75	79	92	70	47	52	75
20	90	76	69	93	74	48	57	69
22	79	68	56	87	76	65	56	60
24	56	54	45	74	58	62	42	47
26	46	56	39	65	41	51	35	43
28	48	62	42	69	39	45	46	50
30	48	55	48	74	40	48	50	44
32	46	50	48	65	39	53	39	31
34			44	50	27	49	28	28
36			41	48	18	42	26	28

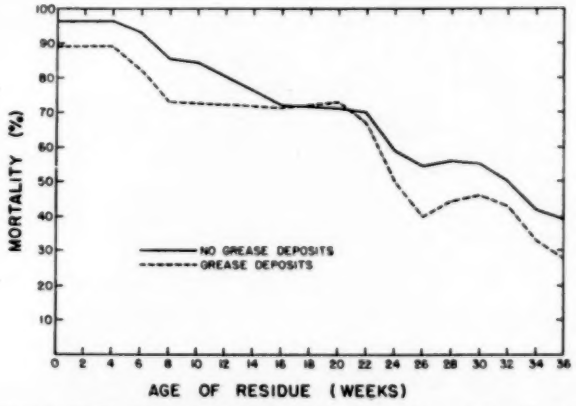

FIGURE 6.—Percentage mortality at 48 hours of *Anopheles quadrimaculatus* adults after 60-minute exposure periods to DDT residues of known age subject to grease deposition.

SUMMARY AND CONCLUSIONS

It has been ascertained that the relationships between various types of household wall surfaces and the residual toxicity of DDT deposits are important factors in the practical use of DDT sprays.

The type of surface influences the residual toxicity of DDT sprays applied at equal rates. DDT on rough wood, fabrics, well-dried paints, and rubbing varnish gives the best residual effect. DDT spray applications on linoleum, fresh paints, spar vanish, or on simu-

lated adobe are not effective against *A. quadrimaculatus* under test conditions. Under the conditions described, even applications of 600 mg. DDT per square foot are ineffective on adobe.

DDT sprays do not damage plastic screen or fabrics which are composed of plant or animal fibers. If applied too heavily, they cause some clouding of high-gloss enamels and some staining of wallpaper. DDT sprays, with either kerosene or Velsicol AR–50 as solvents, produce less deleterious effects on dark-gloss enamels than do the DDT-xylene emulsions.

The nature of the surface definitely affects the final distribution of the DDT deposits. Fabrics, wallpaper, and rough wood tend to hold the crystals on the surface, whereas plain, smooth wood is penetrated by the spray and a considerable portion of the spray deposit remains beneath the surface. Linoleum, fresh paints, and varnishes are readily penetrated by the solvents, and some of the DDT crystals are thereby permanently or temporarily occluded. The incorporation of salt into whitewash produces more effective DDT residual deposits on the outer surface of the whitewash. Grease or smoke depositions on surfaces previously treated with DDT decrease the efficiency of the residues.

REFERENCES

(*1*) Simmons, S. W., and staff: Techniques and apparatus used in experimental studies of DDT as an insecticide for mosquitoes. Pub. Health Rep., Supplement No. 186, pp. 3–20 (1945).

(*2*) Fay, R. W.; Simmons, S. W.; and Clapp, J. M.: Laboratory investigations on the toxicity of DDT residues to adults of *Anopheles quadrimaculatus*. Pub. Health Rep., Supplement No. 186, pp. 21–34 (1945).

DEATHS DURING WEEK ENDED JAN. 4, 1947

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Jan. 4, 1947	Corresponding week, 1946
Data for 93 large cities of the United States:		
Total deaths	10,209	11,928
Median for 3 prior years	11,928	
Deaths under 1 year of age	814	644
Median for 3 prior years	644	
Data from industrial insurance companies:		
Policies in force	67,259,940	67,179,698
Number of death claims	10,044	10,576
Death claims per 1,000 policies in force, annual rate	7.8	8.2

INCIDENCE OF DISEASE

No health department, State, or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 11, 1947

Summary

A total of 4,728 cases of influenza was reported for the current week, as compared with 3,665 last week and a 5-year (1942–46) median of 4,330. Increased incidence was reported in only 3 of the 9 geographic divisions, namely, the Middle Atlantic, West North Central, and West South Central. Four States (Virginia, South Carolina, Texas, and Arizona) reported 81 percent of the total, and the increase in Texas accounted for 966 of the total net increase of 1,063 cases. Only 4 States reported more than 180 cases, and only 5 other States more than 50 cases. These States are as follows (last week's figures in parentheses): *Increases.*—Kansas 86 (36), West Virginia 98 (65), Arkansas 144 (53), Oklahoma 97 (90), Texas 2,397 (1,431); *decreases*—Virginia 504 (615), South Carolina 774 (789), Alabama 51 (69), Arizona 181 (209). The total to date since seasonal low (July 28, 1946) is 41,368, as compared with 442,924 for the same period last year and a median of 43,556 for the corresponding periods of the past 5 years.

A total of 91 cases of poliomyelitis was reported for the week, as compared with 96 last week and a 5-year median of 32. Only 5 States reported more than 4 cases each—California 19, Indiana, Texas and Idaho 7 each, and Kansas 5. The total since seasonal low (March 16, 1946) is 24,955 cases, as compared with 13,448 and 19,093 for the corresponding periods of the past 2 years, respectively, and a 5-year median for the period of 12,165.

The incidence of measles increased during the week in all of the 9 geographic divisions except the East South Central. Of the net increase of 1,220 cases (2,995 to 4,215), a combined increase of 813 cases was reported in the New England and Middle Atlantic areas. Corresponding week last year, 5,314 cases.

Increased incidence of scarlet fever (2,080 to 2,336), the largest increase (114 cases) in the Middle Atlantic area, was reported in all geographic areas except the New England and East North Central. Corresponding week last year, 2,722 cases.

A total of 10,638 deaths was recorded for the week in 93 large cities of the United States, as compared with 10,209 last week, 11,670 and 9,912, respectively, for the corresponding weeks of 1946 and 1945, and a 3-year (1944–46) median of 11,659.

Telegraphic morbidity reports from State health officers for the week ended Jan. 11, 1947, and comparison with corresponding week of 1946 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946	
NEW ENGLAND												
Maine	6	4	1	------	11	------	292	3	16	1	1	2
New Hampshire	0	0	0	------	1	------	22	12	8	0	0	0
Vermont	1	0	0	------	83	------	117	4	8	1	0	0
Massachusetts	19	4	3	------	------	------	443	262	262	1	6	8
Rhode Island	2	0	2	1	9	9	25	1	9	0	0	0
Connecticut	0	14	1	1	83	4	124	17	61	3	4	4
MIDDLE ATLANTIC												
New York	36	16	16	[1] 17	[1] 44	[1] 22	246	855	852	9	28	25
New Jersey	5	8	3	6	69	26	76	53	112	4	11	11
Pennsylvania	13	26	16	3	15	5	1,221	399	776	4	16	16
EAST NORTH CENTRAL												
Ohio	17	31	12	8	34	34	286	41	61	1	15	14
Indiana	10	11	12	19	113	26	11	46	46	3	2	2
Illinois	4	6	6	2	29	21	17	485	176	6	27	9
Michigan [2]	13	6	6	4	17	5	23	383	135	0	10	9
Wisconsin	0	0	1	20	524	147	147	69	437	3	7	4
WEST NORTH CENTRAL												
Minnesota	12	6	5	------	3	2	12	6	14	0	3	2
Iowa	1	1	6	------	------	------	31	3	44	2	1	1
Missouri	6	6	5	9	39	10	5	210	46	6	6	6
North Dakota	1	1	1	37	68	46	2	------	8	0	0	1
South Dakota	5	4	2	------	164	------	2	19	19	1	2	1
Nebraska	1	6	6	25	39	31	4	20	20	0	0	1
Kansas	1	4	4	86	253	16	4	146	68	2	1	4
SOUTH ATLANTIC												
Delaware	0	0	0	------	------	------	1	1	2	0	0	0
Maryland [2]	14	25	6	5	30	22	33	22	22	2	4	10
District of Columbia	0	0	0	3	2	2	19	8	11	0	0	1
Virginia	14	14	11	504	3,975	489	145	159	141	8	10	10
West Virginia	2	6	6	98	577	14	------	15	17	1	8	1
North Carolina	10	24	16	------	------	8	155	36	36	1	10	3
South Carolina	9	6	6	774	2,218	854	70	107	107	3	0	3
Georgia	3	9	9	14	253	157	60	9	21	0	2	2
Florida	5	18	5	18	4	4	9	32	32	6	0	1
EAST SOUTH CENTRAL												
Kentucky	11	4	5	2	178	47	2	181	152	6	6	6
Tennessee	13	14	5	31	583	92	4	68	88	2	6	6
Alabama	4	5	8	51	1,768	281	21	15	19	1	7	7
Mississippi [2]	6	18	9	------	------	------	------	------	------	3	13	5
WEST SOUTH CENTRAL												
Arkansas	8	11	11	144	1,249	212	29	18	51	0	3	3
Louisiana	8	9	9	26	5,221	9	1	22	22	4	3	3
Oklahoma	2	12	10	97	917	189	8	19	19	1	2	2
Texas	32	51	51	2,397	9,163	2,078	59	175	175	1	14	14
MOUNTAIN												
Montana	2	0	1	21	143	19	188	8	26	0	1	1
Idaho	0	1	1	23	823	2	6	227	12	0	3	0
Wyoming	1	0	0	12	------	36	1	20	20	0	0	1
Colorado	6	13	9	50	209	68	14	83	83	1	1	2
New Mexico	3	1	1	4	3	4	41	6	2	1	1	1
Arizona	2	3	1	181	565	166	77	5	7	1	1	2
Utah [2]	0	0	0	12	2,284	12	2	61	24	0	1	1
Nevada	0	0	0	------	1	------	------	15	5	1	0	0
PACIFIC												
Washington	5	2	4	------	------	1	32	245	102	1	2	9
Oregon	4	7	2	16	219	28	42	41	65	0	1	2
California	23	28	29	7	652	160	86	682	470	9	23	23
Total	340	435	353	4,728	32,635	4,330	4,215	5,314	8,225	100	262	262
2 weeks	706	893	739	8,393	80,676	8,719	7,210	8,083	16,158	183	453	489
Seasonal low week [3]	(27th) July 5–11			(30th) Jul. 26–Aug. 1			(35th) Aug. 30–Sept. 5			(37th) Sept. 13–19		
Total since low	8,272	12,537	9,774	41,368	442,924	43,556	30,097	34,207	54,420	1,154	1,957	1,957

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Dates between which the approximate low week ends. The specific date will vary from year to year.

Telegraphic morbidity reports from State health officers for the week ended Jan. 11, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended—		Median 1942–46	Week ended		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946		Jan. 11, 1947	Jan. 12, 1946	
NEW ENGLAND												
Maine	1	0	0	27	32	28	0	0	0	1	0	0
New Hampshire	0	0	0	3	13	9	0	0	0	0	0	0
Vermont	0	0	0	4	14	3	0	0	0	1	0	0
Massachusetts	1	0	1	148	183	299	0	0	0	4	0	0
Rhode Island	0	0	0	5	14	14	0	0	0	0	0	0
Connecticut	1	0	0	32	33	57	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	4	7	6	286	352	399	0	0	0	3	0	1
New Jersey	0	0	0	102	68	104	0	0	0	0	1	1
Pennsylvania	0	5	0	159	191	272	0	0	0	2	3	2
EAST NORTH CENTRAL												
Ohio	0	3	1	309	198	265	1	0	0	0	1	1
Indiana	7	0	0	82	73	89	0	0	1	1	1	1
Illinois	2	2	1	127	124	231	0	0	0	3	4	1
Michigan [3]	2	3	1	119	118	118	0	0	0	0	0	0
Wisconsin	0	0	0	88	91	141	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	1	0	1	35	63	77	0	0	0	0	0	1
Iowa	2	3	1	33	30	63	0	0	0	1	0	0
Missouri	2	0	0	34	56	92	0	0	0	1	2	1
North Dakota	0	0	0	4	12	15	0	0	0	0	0	0
South Dakota	1	0	0	4	10	32	0	0	0	0	0	0
Nebraska	1	0	0	38	28	33	0	0	0	0	0	0
Kansas	5	0	0	42	64	75	0	2	1	1	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	5	6	6	0	0	0	0	0	0
Maryland [3]	0	0	0	37	62	66	0	0	0	0	1	1
District of Columbia	0	0	0	16	14	25	0	0	0	0	0	0
Virginia	0	0	0	52	66	53	0	0	0	1	3	1
West Virginia	1	0	0	24	57	57	0	0	0	0	0	0
North Carolina	4	2	0	19	52	52	0	0	0	1	1	1
South Carolina	0	0	0	19	16	16	0	0	0	0	1	1
Georgia	1	0	0	9	13	20	1	0	0	1	2	2
Florida	3	3	0	18	8	8	0	0	0	0	1	1
EAST SOUTH CENTRAL												
Kentucky	0	0	0	41	43	51	0	0	0	0	1	1
Tennessee	4	1	1	30	42	58	1	0	0	5	2	2
Alabama	1	0	1	14	15	15	0	2	1	1	0	0
Mississippi [3]	3	0	0	10	17	13	0	0	0	4	1	1
WEST SOUTH CENTRAL												
Arkansas	2	2	1	3	8	10	2	0	0	0	0	2
Louisiana	2	0	0	5	10	10	0	0	0	3	4	4
Oklahoma	0	1	0	6	40	30	0	1	1	0	1	1
Texas	7	1	1	41	104	62	0	0	0	5	5	4
MOUNTAIN												
Montana	0	1	0	3	21	21	0	0	0	0	0	0
Idaho	7	0	0	16	13	14	0	0	0	0	0	0
Wyoming	1	1	0	3	9	10	0	0	0	0	0	0
Colorado	2	0	1	45	31	38	0	0	0	0	0	0
New Mexico	0	0	0	14	13	8	0	0	0	0	0	0
Arizona	0	1	1	5	11	11	0	0	0	0	1	0
Utah [3]	0	4	0	17	39	67	0	0	0	0	0	0
Nevada	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	2	1	1	42	27	31	0	0	0	2	0	0
Oregon	2	0	1	23	23	23	0	0	0	0	0	1
California	19	13	4	138	195	195	0	0	0	2	5	3
Total	91	54	32	2,336	2,722	3,637	5	5	11	43	41	49
2 weeks	187	111	80	4,416	5,105	7,094	8	9	21	81	81	94
Seasonal low week [3]	(11th) Mar. 15–21			(32nd) Aug. 9–15			(35th) Aug. 30–Sept. 5			11th) Mar. 15–21		
Total since low	24,955	13,448	12,165	31,102	43,676	45,489	62	85	141	3,609	4,332	5,078

[2] Period ended earlier than Saturday.
[3] Dates between which the approximate low week ends. The specific date will vary from year to year.
[4] Including paratyphoid fever reported separately, as follows: Massachusetts 4 (salmonella infection); New York 2; Louisiana 1; Washington 1; California 2.

Telegraphic morbidity reports from State health officers for the week ended Jan. 11, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Whooping cough			Week ended Jan. 11, 1947							
	Week ended—		Median 1942–46	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Jan. 11, 1947	Jan. 12, 1946		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	17	43	34								1
New Hampshire		10	3								1
Vermont	19	34	34								4
Massachusetts	196	119	189	1							
Rhode Island	9	71	19								
Connecticut	46	83	92								1
MIDDLE ATLANTIC											
New York	298	346	346	2	2						8
New Jersey	123	183	183	1							2
Pennsylvania	221	157	173				1				1
EAST NORTH CENTRAL											
Ohio	88	64	93						2		2
Indiana	34	19	23						6		5
Illinois	104	59	77	4	2		3		2		7
Michigan [3]	171	98	122		6				1		3
Wisconsin	149	56	80								
WEST NORTH CENTRAL											
Minnesota	6	12	38								
Iowa	9	5	11				1				7
Missouri	21	7	13						2		
North Dakota			4								
South Dakota		2	2								1
Nebraska	11		3								
Kansas	8	34	48				1		2		2
SOUTH ATLANTIC											
Delaware	9		1								
Maryland [3]	80	27	77			1			3		
District of Columbia	11	9	9						1		
Virginia	31	36	39			48			5		
West Virginia	36	21	25								
North Carolina	67	79	79						5	2	
South Carolina	66	93	64	2	3				1	1	
Georgia	4	20	13		1				4	14	
Florida	32	8	21	1			1			6	2
EAST SOUTH CENTRAL											
Kentucky	43	38	38								
Tennessee	23	9	29	2					3	2	1
Alabama	28	58	22						1	5	2
Mississippi [3]											2
WEST SOUTH CENTRAL											
Arkansas	9	3	11						4	1	1
Louisiana	5		2		1					14	1
Oklahoma	5	4	6								
Texas	240	125	145	4	408	57			1	16	7
MOUNTAIN											
Montana	2	1	9								
Idaho	3	21	2								
Wyoming			6								
Colorado	9	27	27								5
New Mexico		4	4		3						
Arizona	18	4	18			18					
Utah [3]	12	3	8								
Nevada		2									
PACIFIC											
Washington	23	28	38	1							
Oregon	8	10	10								
California	57	123	182		1		1			1	1
Total	2,351	2,165	2,263	18	427	124	8	0	43	62	67
Same week, 1946	2,155			31	405	162	8	0	32	75	69
Median, 1942–46	2,263			31	337	75	8	0	32	70	[4] 69
2 weeks: 1947	4,097			55	749	597	12	1	94	99	153
1946	3,528			68	855	263	14	0	52	142	108
Median, 1942–46	4,108			47	633	122	14	0	54	142	[4] 116

[3] Period ended earlier than Saturday. [4] 2-year average.

Anthrax: Maine 1 case. *Botulism*: Maryland 4 cases. *Leprosy*: California 2 cases.

WEEKLY REPORTS FROM CITIES [1]

City reports for week ended Jan. 4, 1947

This table lists the reports from 84 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	-----	0	27	1	2	0	4	0	1	1
New Hampshire:												
Concord	0	0	-----	0	-----	0	0	0	0	0	0	-----
Vermont:												
Barre	0	0	-----	0	1	0	1	0	0	0	0	2
Massachusetts:												
Boston	7	0	-----	0	9	0	16	1	20	0	0	29
Fall River	0	0	-----	0	-----	0	1	0	4	0	0	10
Springfield	2	0	-----	0	6	0	2	0	3	0	0	2
Worcester	0	0	-----	0	4	0	6	1	2	0	0	9
Rhode Island:												
Providence	0	0	1	0	10	0	4	0	6	0	0	7
Connecticut:												
Bridgeport	0	0	-----	0	-----	0	0	0	0	0	0	4
Hartford	0	0	-----	0	2	0	1	0	5	0	0	1
New Haven	0	0	-----	0	33	0	2	0	4	0	0	5
MIDDLE ATLANTIC												
New York:												
Buffalo	4	0	-----	0	-----	0	4	0	6	0	1	3
New York	18	1	8	1	41	1	78	3	71	0	0	52
Rochester	0	0	-----	0	-----	0	4	0	6	0	1	-----
Syracuse	0	0	-----	0	-----	0	0	0	5	0	0	11
New Jersey:												
Camden	1	0	-----	0	-----	0	1	0	1	0	0	3
Newark	0	0	-----	0	2	0	4	0	11	0	0	12
Trenton	0	1	-----	0	29	0	3	0	1	0	0	-----
Pennsylvania:												
Philadelphia	4	0	4	1	4	0	18	1	18	0	0	35
Pittsburgh	1	0	1	0	262	1	13	0	6	0	0	6
Reading	0	0	-----	0	1	0	1	0	1	0	0	6
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	1	0	-----	1	1	1	3	0	2	0	0	4
Cleveland	2	0	2	0	195	2	12	0	25	0	0	9
Columbus	4	0	-----	0	3	0	4	0	11	0	0	7
Indiana:												
Fort Wayne	0	0	-----	0	6	0	1	0	0	0	0	-----
Indianapolis	1	0	-----	0	1	0	7	0	6	0	0	8
South Bend	0	0	-----	0	-----	0	0	0	2	0	0	-----
Terre Haute	0	0	-----	0	1	0	1	0	1	0		-----
Illinois:												
Chicago	1	0	-----	0	9	1	28	2	44	0	0	42
Michigan:												
Detroit	6	1	2	0	1	0	15	0	33	0	0	61
Flint	0	0	-----	0	-----	0	3	0	0	0	0	-----
Grand Rapids	0	0	-----	0	1	0	2	0	5	0	0	8
Wisconsin:												
Kenosha	0	0	-----	0	-----	0	0	0	0	0	0	-----
Milwaukee	0	0	-----	0	4	0	0	0	10	0	0	57
Racine	0	0	-----	0	-----	0	0	1	5	0	0	5
Superior	0	0	-----	0	1	0	0	0	0	0	0	-----
WEST NORTH CENTRAL												
Minnesota:												
Duluth	1	0	-----	0	-----	0	2	0	2	0	0	-----
Minneapolis	2	0	-----	0	3	0	5	0	6	0	0	1
St. Paul	0	0	-----	0	2	0	5	0	4	0	0	-----
Missouri:												
Kansas City	2	0	-----	1	-----	1	5	1	5	0	0	4
St. Joseph	0	0	-----	0	-----	0	0	0	1	0	0	11
St. Louis	2	0	1	0	6	1	16	0	14	0	0	6

[1] In some instances the figures include nonresident cases.

City reports for week ended Jan. 4, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	-----	0	1	1	8	0	4	0	0	2
Kansas:												
Topeka	0	0	-----	0	-----	0	0	0	2	0	0	-----
Wichita	0	0	-----	0	-----	0	2	0	3	0	0	-----
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	-----	0	-----	0	1	0	2	0	0	1
Maryland:												
Baltimore	12	0	2	1	1	0	9	0	14	0	0	33
Cumberland	0	0	-----	0	3	0	1	0	1	0	0	-----
District of Columbia:												
Washington	0	0	1	0	31	2	10	0	7	0	0	11
Virginia:												
Lynchburg	0	0	-----	0	-----	0	0	0	1	0	0	-----
Richmond	0	0	1	1	32	0	1	1	4	0	0	-----
Roanoke	0	0	-----	0	-----	0	1	0	1	0	0	-----
West Virginia:												
Charleston	0	0	-----	0	3	0	0	0	0	0	0	-----
Wheeling	0	0	-----	0	-----	0	0	0	1	0	0	-----
North Carolina:												
Wilmington	0	0	-----	0	5	0	0	0	0	0	0	-----
Winston Salem	0	0	-----	0	29	0	1	0	1	0	0	2
South Carolina:												
Charleston	0	0	5	0	1	0	1	0	0	0	0	-----
Georgia:												
Brunswick	0	0	-----	0	1	0	0	0	0	0	0	-----
Savannah	1	0	1	1	34	0	1	0	1	0	0	-----
Florida:												
Tampa	1	0	-----	0	1	0	4	0	6	0	0	6
EAST SOUTH CENTRAL												
Tennessee:												
Nashville	0	0	-----	1	-----	0	0	0	2	0	0	-----
Alabama:												
Birmingham	0	0	1	1	7	0	3	0	2	0	0	2
Mobile	1	0	3	0	-----	1	1	0	1	0	0	-----
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	-----	1	-----	0	1	0	0	0	0	-----
Louisiana:												
New Orleans	1	0	2	1	9	1	8	1	2	0	1	-----
Shreveport	1	0	-----	0	-----	0	10	1	0	0	0	-----
Texas:												
Dallas	0	0	1	1	4	0	2	0	1	0	0	-----
Galveston	0	0	-----	0	-----	0	4	0	1	0	0	-----
Houston	0	0	-----	0	-----	1	6	0	2	0	0	1
San Antonio	0	0	1	2	-----	0	4	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0	-----	0	2	0	5	0	1	0	0	1
Great Falls	0	0	-----	0	20	0	0	0	0	0	0	-----
Helena	0	0	-----	0	7	0	0	0	0	0	0	-----
Missoula	0	0	-----	0	-----	0	2	0	0	0	0	-----
Idaho:												
Boise	0	0	-----	0	-----	0	1	0	0	0	0	-----
Colorado:												
Denver	2	0	6	1	-----	0	8	0	15	0	0	3
Pueblo	0	0	-----	0	-----	0	1	0	2	0	0	-----
Utah:												
Salt Lake City	0	0	-----	0	7	0	3	0	8	0	0	-----

City reports for week ended Jan. 4, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	7	0	-----	0	2	0	5	0	3	0	1	3
Spokane	0	0	-----	0	3	0	0	2	3	0	0	-----
Tacoma	0	0	-----	0	-----	0	0	0	0	0	0	-----
California:												
Los Angeles	5	0	7	0	5	1	6	4	14	0	0	7
Sacramento	0	0	-----	0	-----	0	3	2	0	0	0	3
San Francisco	1	0	1	0	3	1	8	1	10	0	0	-----
Total	91	3	51	15	876	17	391	22	466	0	5	497
Corresponding week, 1946	69	-----	1,079	118	1,505	-----	696	-----	541	0	9	503
Average 1942–46	72	-----	[1] 1,345	[2] 146	[1] 1,509	-----	[2] 691	-----	1,001	0	10	688

[1] 3-year average, 1944–46.
[2] 5-year median, 1942–46.

Dysentery, amebic.—Cases: New York 9.
Dysentery, bacillary.—Cases: Detroit 1; Los Angeles 1.
Dysentery, unspecified.—Cases: San Antonio 3.
Tularemia.—Cases: St. Louis 1; Wichita 1.
Typhus fever, endemic.—Cases: Tampa 1; Mobile 3; New Orleans 1; Houston 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 84 cities in the preceding table (estimated population, 1943, 33,622,700)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	23.5	0.0	2.6	0.0	240	2.6	91.5	5.2	125	0.0	2.6	183
Middle Atlantic	13.0	0.9	2.0	0.9	157	0.9	58.3	1.9	58	0.0	0.9	59
East North Central	9.2	0.6	2.5	0.6	137	2.5	46.6	1.8	88	0.0	0.0	123
West North Central	14.1	0.0	2.0	2.0	24	6.0	86.5	2.0	82	0.0	0.0	48
South Atlantic	25.8	0.0	18.4	5.5	260	3.7	45.2	1.8	72	0.0	0.0	98
East South Central	9.1	0.0	36.4	18.2	64	9.1	36.4	0.0	46	0.0	0.0	18
West South Central	5.7	0.0	11.5	14.3	37	5.7	100.4	5.7	20	0.0	2.9	6
Mountain	15.9	0.0	47.7	7.9	286	0.0	158.9	0.0	207	0.0	0.0	32
Pacific	20.6	0.0	12.7	0.0	21	3.2	34.8	14.2	47	0.0	1.6	21
Total	14.2	0.5	7.9	2.3	136	2.6	60.8	3.4	72	0.0	0.8	77

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—Under date of January 2, 1947, plague infection was reported in 1 rat found dead in Kalopa Mauka Camp, Hamakua District, Island of Hawaii, T. H.

Panama Canal Zone

Notifiable diseases—October 1946.—During the month of October 1946, certain notifiable diseases were reported in the Panama Canal Zone and terminal cities as follows:

Disease	Residence [1]									
	Panama City		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	7		3		4		5		19	
Diphtheria	17	1	2	1	2		13	3	34	5
Dysentery:										
Amebic	2				1		2		5	
Bacillary	3		1				1		5	
Leprosy		1								1
Malaria [2]	10		1		22		42	5	75	5
Measles	23	3	30	1	29		15		97	4
Mumps					16		2		18	
Pneumonia		15		8	21	4		3	[3] 21	30
Tuberculosis		27		8	3	3		2	[3] 3	40
Typhus fever			1						1	
Whooping cough					4				[3] 4	

[1] If place of infection is known, cases are so listed instead of by residence.
[2] 14 recurrent cases.
[3] In the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 21, 1946.—During the week ended December 21, 1946, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		41		214	501	26	30	79	134	1,025
Diphtheria		4		45	6	2	3		5	65
Dysentery:										
Amebic					1					1
Bacillary					1					1
German measles				5	7		1	7	3	23
Influenza		13			8				5	26
Measles		279	2	51	168	105	328	224	176	1,333
Meningitis, meningococcus				4		1				5
Mumps				56	319	32	106	19	132	664
Poliomyelitis				11	5			1		17
Scarlet fever	1	6	11	77	116	5	3	6	8	233
Tuberculosis (all forms)		7	5	107	58	8	12	33	83	313
Typhoid and paratyphoid fever				13			1		1	15
Undulant fever				1	2	1			1	5
Venereal diseases:										
Gonorrhea		23	9	76	99	36	26	52	(1)	321
Syphilis		8	4	92	86	8	20	12	(1)	230
Other forms				1					(1)	1
Whooping cough	3	3	3	60	69	7		2	3	150

[1] Report not received for this period.

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From consular reports, international health organizations, medical officers of the Public Health Service, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January–October 1946	November 1946	December 1946—week ended—			
				7	14	21	28
ASIA							
Afghanistan	C		30				
Burma	C	1,289	173		45	6	
Bassein	C	29					
Moulmein	C	76	112	8	1	3	
Rangoon	C	23					
Ceylon	C	85	13				
China:							
Anhwei Province	C	2,749					
Chekiang Province	C	4,633	8				
Formosa, Island of	C	1,980					
Fukien Province	C	1,355	3				
Foochow	C	709	3				
Honan Province	C	1,654					
Hopeh Province	C	292					

CHOLERA—Continued

Place		January–October 1946	November 1946	December 1946—week ended— 7	14	21	28
ASIA—continued							
China—Continued							
Hunan Province	C	2,040					
Hupeh Province	C	359					
Ichang Province	C	147					
Kiangsi Province	C	1,594					
Kiangsu Province	C	[1] 9,218	3				
Shanghai	C	[1] 4,570	3				
Kwangsi Province	C	952					
Kwangtung Province	C	4,888	2				
Canton	C	2,002					
Hong Kong	C	505					
Kweichow Province	C	8					
Macao, Island of	C	2					
Shantung Province	C	21					
Szechwan Province	C	137					
Yunnan Province	C	17					
India	C	65,107	4,894				
Bombay	C		[2]				
Calcutta	C	1,843	[3] 34	20	14	14	
Cawnpore	C	45					
Chittagong	C	8					
Madras	C	3	2				
India (French)	C	2	2				
Indochina (French):							
Cambodia	C	402	30				
Cochinchina	C	858	9				
Bien Hoa	C	24					
Chaudok	C	21					
Mytho	C	144					
Rachgia	C	1					
Saigon-Cholon	C	38	11			2	1
Vinh-long	[1] C	7		1			
Laos	C	21					
Japan	C	1,200	4	2	7		
Korea (Chosen)	C	[2] 11,351					
Malay States	C	234	11				
Manchuria	C	18,454	4				
Mongolia	C	16					
Siam (Thailand)	C	3,520	351				
Bangkok	C	494	31		9	22	
Straits Settlements: **Singapore**	C	[2] 1					

[1] Includes imported cases.
[2] Imported.
[3] From the beginning of the outbreak in April or May to approximately Sept. 1, 1946.

PLAGUE

[C indicates cases; P, present]

AFRICA							
Algeria	C	2					
Bechuanaland	C	[1] 21					
Belgian Congo	C	30		2			
British East Africa:							
Kenya	C	38					
Uganda	C	12					
Egypt	C	216	1				
Alexandria	C	126					
Ismailiya	C	27					
Matariya	C	12					
Port Said	C	18	1				
Suez	C	32					
Libya: Tripolitania—Plague-infected rats		1					
Madagascar	C	186	25		[2] 3		
Union of South Africa	C	2	3	1			1
ASIA							
Burma	C	1246	206		38	82	
Bassein	C	23					
Mandalay	C		1				
Rangoon	C	154					

See footnotes at end of table.

PLAGUE—Continued

Place		January–October 1946	November 1946	December 1946—week ended— 7	14	21	28
ASIA—continued							
China:							
Chekiang Province	C	710	3				
Formosa, Island of	C	11					
Fukien Province	C	4,366	1				
Amoy	C	307					
Foochow	C	1,400	1				
Kiangsi Province	C	267					
Kwangtung Province	C	415					
Yunnan Province	C	280					
India	C	15,316	2,309				
Indochina (French): Cochinchina	C	48					
Java	C	34	4				
Manchuria	C	[3] 316					
Palestine	C	16		1			
Siam (Thailand)	C	27	11				
EUROPE							
Great Britain: Malta, Island of	C	6					
Portugal: Azores	C	[4] 15	1	3			
NORTH AMERICA							
Canada.[5]							
SOUTH AMERICA							
Argentina:							
Buenos Aires	C		8				
Cordoba Province	C	1					
Bolivia:							
Chuquisaca Department	C	1					
Santa Cruz Department	C	12					
Tarija Department—Plague-infected rats		P					
Brazil:							
Alagoas State	C	2					
Bahia State	C	32					
Ceara State	C	44					
Minas Geraes State	C						[6] 12
Parahyba State	C	18					
Pernambuco State	C	35					
Ecuador:							
Chimborazo Province	C	2					
Loja Province	C	28	6				
Peru:							
Lambayeque Department	C	14					
Lima Department	C	20					
Piura Department	C	34					
Tumbes Department	C	1					
Plague-infected rats		P					
Venezuela	C	1					
OCEANIA							
Hawaii Territory: Plague-infected rats		[7] 6					1

[1] Includes 16 cases of pneumonic plague.
[2] For the period Dec. 1–15, 1946.
[3] Includes 52 cases of pneumonic plague.
[4] Includes 2 cases of pneumonic plague.
[5] The imported suspected case previously reported has not been confirmed. Under date of Sept. 14, 1946, plague infection was reported in a pool of fleas from squirrels in Alsask and in a pool of fleas from squirrels in Superb, Saskatchewan, Canada.
[6] For the month of December 1946.
[7] Plague infection was also proved in Hawaii Territory as follows: On Feb. 5, 1946, in a pool of 29 rats; on Apr. 13, 1946, in a pool of 54 fleas and 15 lice recovered from 7 rats and 22 mice; under date of July 3, 1946, in a pool of 50 fleas recovered from 7 rats and 46 mice, and in a pool of 51 fleas recovered from 10 rats; under date of July 17, 1946, in a pool of 48 fleas recovered from 22 rats, and in a pool of 56 fleas recovered from 33 rats; under date of Sept. 12, 1946, in a pool of 48 fleas recovered from 22 rodents; under date of Oct. 9, 1946, in a pool of 36 rats found on Sept. 10, 1946.

SMALLPOX

[C indicates cases; P, present]

Place		January–October 1946	November 1946	December 1946—week ended— 7	14	21	28
AFRICA							
Algeria	C	258					
Angola	C	29					
Basutoland	C	46					
Bechuanaland	C	11					
Belgian Congo	C	[1] 3,076	[1] 204	[1] 39	[1] 41		
British East Africa:							
Kenya	C	809	49				
Nyasaland	C	560	157	11			
Tanganyika	C	5,468	536	[2] 658			
Uganda	C	558	10	3			
Cameroon (French)	C	73	17		1		
Dahomey	C	1,570	11				
Egypt	C	384		3			
Eritrea	C	23					
French Equatorial Africa	C	162					
French Guinea	C	922	13				
French West Africa: Dakar District	C	40					
Gambia	C	7					
Gold Coast	C	1,040	245	30		[2] 39	
Ivory Coast	C	1,382	83				
Liberia	C	40	150				
Libya	C	476	232	54	57	50	54
Madagascar	C	1					
Mauritania	C	1					
Morocco (French)	C	1,854	21				
Morocco (Int. Zone)	C	178					
Morocco (Spanish)	C	5					
Mozambique	C	4					
Nigeria	C	6,091	66				
Niger Territory	C	472	57			[2] 19	
Rhodesia:							
Northern	C	410	14				
Southern	C	144	4				
Senegal	C	95					
Sierra Leone	C	451					
Somaliland (Italian)	C	1					
Sudan (Anglo-Egyptian)	C	53	3				
Sudan (French)	C	1,983	4			[2] 7	
Swaziland	C		1				
Togo (French)	C	242	52				
Tunisia	C	102					
Union of South Africa	C	661	13	P	P		
ASIA							
Arabia	C	2					
Burma	C	1,759	76		51	41	
Ceylon	C	502	29				
China	C	1,152	905	196	173	106	104
India	C	57,770	868				
India (French)	C	3					
India (Portuguese)	C	17	2				
Indochina (French)	C	2,030	130	4	42	10	
Iran	C	26					
Iraq	C	8	14				
Japan	C	17,661	61	22	24		
Malay States	C	1,666	653	262	181	211	
Palestine	C	[4] 2					
Rhodes, Island of	C	[4] 1					
Siam (Thailand)	C	17,250	441				
Straits Settlements	C	73	108	13	2	6	5
Syria and Lebanon	C	8			1		
Turkey (see Turkey in Europe).							
EUROPE							
Czechoslovakia	C	24					
France	C	15	1				
Germany	C	1					
Gibraltar	C	[4] 3					
Great Britain:							
England and Wales	C	[5] 53					
Malta, Island of		10					
Scotland	C	2					
Greece	C	114					
Italy	C	548					

See footnotes at end of table.

SMALLPOX—Continued

Place		January–October 1946	November 1946	December 1946—week ended— 7	14	21	28
EUROPE—continued							
Portugal	C	54	3				
Spain	C	7					
Turkey	C	17					
Yugoslavia	C	1					
NORTH AMERICA							
Canada	C	2					
Guatemala	C	55					
Honduras	C	4					
Mexico	C	396					
Nicaragua	C	3					
SOUTH AMERICA							
Argentina	C	69					
Bolivia	C	874					
Brazil	C	[1] 289	15	2	2		
Colombia	C	849	165				
Ecuador	C	54	28				
Paraguay	C	[1] 289					
Peru	C	451					
Uruguay	C	40					
Venezuela	C	[1] 896	[1] 849				
OCEANA							
Hawaii Territory	C	[6] 1					

[1] Includes alastrim.
[2] Includes delayed reports.
[3] For the period Dec. 1–20, 1946.
[4] Imported.
[5] Includes imported cases.
[6] Off-shipping.

TYPHUS FEVER *

[C indicates cases; P, present]

AFRICA							
Algeria	C	783					
Basutoland	C	7					
Belgian Congo [1]	C	2,480	77	4			
British East Africa:							
Kenya	C	24	2				
Uganda	C			1			
Egypt	C	1,378	15	10	2		
Eritrea	C	1,057	267	23	23		
French West Africa: Dakar District	C	7					
Libya	C	85	3				
Madagascar	C	1					
Morocco (French)	C	3,704	40				
Morocco (Int. Zone)	C	53					
Morocco (Spanish)	C	25					
Nigeria	C	33	1				
Rhodesia, Northern	C	1					
Sierra Leone [1]	C	5					
Tunisia [1]	C	183					
Union of South Africa [1]	C	498	12	P	P		
ASIA							
Arabia [2]	C	2					
Burma [1]	C	2	1		1		
China [1]	C	354	5	1	1	2	
India	C	299				1	
Indochina (French)	C	61					
Iran	C	138	4				
Iraq	C	196	9	5	2	1	3
Japan	C	30,762	145	64	54		
Malay States	C	3					
Manchuria	C	89					
Palestine [2]	C	91	1				
Philippine Islands [1]	C	3	1				
Straits Settlements	C	2					
Syria and Lebanon	C	84	2				
Trans-Jordan	C	21					
Turkey. (See Turkey in Europe.)							

See footnotes at end of table.

TYPHUS FEVER—Continued

Place		January–October 1946	November 1946	December 1946—week ended— 7	14	21	28
EUROPE							
Albania	C	96					
Austria	C	34	1				
Belgium [1]	C	14					
Bulgaria	C	979	54	25			
Czechoslovakia [1]	C	785	3				
France [1]	C	16					
Germany	C	1,868				1	
Gibraltar [2]	C	1					
Great Britain:							
England and Wales	C	1					
Malta and Gozo [1]	C	27	2				
Greece [1]	C	550	34	8	19	13	
Hungary	C	942	76	13	[3] 10		14
Italy	C	25					
Netherlands [1]	C	24					
Poland	C	3,285	72	19			
Portugal	C	10	2	1	1		
Rumania	C	7,697	250	138			
Spain	C	26					
Canary Islands	C	2					
Sweden [3]	C	1					
Switzerland [1]	C	2					
Turkey	C	1,232	93	25	27	35	
Union of Soviet Socialist Republics: Ukraine	C	P					
Yugoslavia	C	2,954	17				
NORTH AMERICA							
Costa Rica [2]	C	77					
Cuba [2]	C	19					
Guatemala	C	732	23				
Jamaica [2]	C	36	2				
Mexico	C	1,469					
Panama Canal Zone	C	1					
Panama (Republic)	C	2	1				
Puerto Rico [3]	C	93	8				
Virgin Islands [2]	C	3					
SOUTH AMERICA							
Argentina	C	5	2				
Bolivia	C	249					
Brazil [1]	C	10	6			1	
Chile	C	448					
Colombia	C	467	218				
Curacao [2]	C	1					
Ecuador [1]	C	966	46				
Paraguay	C	1					
Peru	C	783					
Venezuela [1]	C	101					
OCEANIA							
Australia [2]	C	144	2				
Hawaii Territory [3]	C	75	8				

*Reports from some areas are probably murine type, while others probably include both murine and louse-borne types. [1] Includes cases of murine type. [2] Murine type.

YELLOW FEVER

[C indicates cases; D, deaths]

AFRICA							
French Equatorial Africa: Carnot	C		[1] 3	[2] 5			
Ivory Coast: Seguela	C		1				
Nigeria:							
Ibadan	C	1					
Ilorin	C	1					
Kafanchan	C	2					
Ogbomosho	C	41					
Sierra Leone: Pujehan	C	1					
SOUTH AMERICA							
Bolivia: Santa Cruz Department	D	[3] 40					
Brazil: Para State	D	1					
Colombia:							
Caqueta Territory	D	2					
Magdalena Department	D	1					
Santander Department	D	13					
Peru: San Martin Department	D	3					
Venezuela:							
Tachira State	C	4					
Trujillo State	C	4					
Zulia State	C	4					

[1] Includes 2 suspected cases. [2] Diagnosis confirmed in 4 cases.
[3] Diagnosis confirmed in 14 cases and 10 deaths.

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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